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New compounds $CuCr_{1.5}Sb_{0.5}S_4$ and its solid solution with $CuCr_2S_4$

D.A. Saifullaeva, Sh. Soliva, M. Malikov, Sh. Urakov
703004, 15 University blvrd, Samarkand, Republic of Uzbekistan

New compounds with spinel structure $CuCr_{1.5+x}Sb_{0.5-x}S_4$ ($0 \leq x \leq 0.3$) were obtained and studied in detail. All the compounds are non-degenerate semiconductors. It should be noted that the natural florensovite contains also up to 26% Zn, So it is rather a solid solution between $CuCr_{1.5}Sb_{0.5}S_4$ and $ZnCr_2S_4$. We managed to prepare a synthetic analogue of florensovite $CuCr_{1.5}Sb_{0.5}S_4$ and its solid solution with $CuCr_2S_4$. A compound $CuCr_{1.5}Sb_{0.5}S_4$ is especially interesting because it contains pentavalent Sb which was not observed in chalcospinels before. As an interatomic distance $(Sb\text{-}S)_6$ in octahedral is equal to the invariant characteristic distance β-Sb^{5+} =2.538 Åwe get this conclusion. The former one is calculated from the lattice parameter a=10.018 Åand taulated β-Cr^{3+} =2.411 Åand α-Cu^{1+}=2.279 Å. No ertrareflections due to possible 1:3 ordering in octahedral sites were observed for this composition. Powder samples of $CuCr_{1.5}Sb_{0.5}S_4$ were synthesized from elements in the elements in the evacuated quartz vails (5500°C, 48 h). The compounds $0 \leq x \leq 0.1$ were found to have the magnetic properties characteristic for antiferromagnets. Compounds $0.2 \leq x \leq 0.3$ have a spontaneous magnetization, with the Curie point of the compound with x=0.3, i.e. T_c=334 K, being higher than room temperature. The re-entrant spin glass transition is observed in the compound with x=0.2